

ORIGINAL

RECEIVED

MAY 24 1995

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of)
)
)

Amendment of Part 90 of the)
Commission's Rules to Adopt)
Regulations for Automatic)
Vehicle Monitoring Systems)
)
_____)

PR Docket No. 93-61

DOCKET FILE COPY ORIGINAL

**OPPOSITION TO PETITION FOR RECONSIDERATION
OF HUGHES TRANSPORTATION MANAGEMENT SYSTEMS**

LATHAM & WATKINS
Gary M. Epstein
Raymond B. Grochowski
1001 Pennsylvania Ave., N.W.
Washington, D.C. 20004

No. of Copies rec'd
List ABCDE

0711

May 24, 1995

SUMMARY

Hughes Transportation Management Systems opposes proposals contained in Petitions for Reconsideration that would hinder, or even destroy, the ability of non-multilateration LMS providers to provide service to the public. Specifically:

1. Hughes opposes Metricom's request that certain rules be expanded in their applicability to non-multilateration systems. The rules in question address the possibility of interference between multilateration systems and Part 15 devices, and are not applicable to non-multilateration systems. Such systems are restricted in coverage areas by existing rules, are therefore unlikely to result in significant interference problems with Part 15 devices, and were properly excluded from the rules in question.
2. Hughes opposes the proposal of the Part 15 Coalition that the Commission either reduce the transmit power limitation of non-multilateration LMS systems to one watt, or to limit such systems to operating "within fifty meters of a highway toll plaza or rail siding." Again, such measures are not warranted by any real concerns regarding the likelihood of interference. Further, they would render non-multilateration systems useless for most current and proposed services.
3. Hughes opposes the frequency tolerance levels proposed for non-multilateration LMS systems by AMTECH and Texas Instruments. While Hughes agrees with these parties that the current tolerance is unnecessarily strict, and has also filed a petition seeking reconsideration of this rule, the specifications proposed are still more restrictive than necessary to prevent interference, in view of the operational characteristics of non-multilateration systems.

4. Hughes opposes the non-multilateration field strength limit proposed by AMTECH.
The proposal is much higher than the field strength that would actually be measured for systems complying with the Commission's antenna height and power limits.
5. Hughes opposes the emission mask changes proposed by multilateration proponents.
As proposed, these would lead to unacceptable levels of interference in non-multilateration sub-bands. Hughes has proposed an acceptable change to the proposed attenuation formula.
6. Hughes opposes the proposal of UTC that signals from mobile transmitters be limited to two-seconds in duration, and that such transmitters be permitted only one transmission in any 30 minute period. This proposal is meaningless for non-multilateration system geometries, and would make such systems incapable of providing service.

TABLE OF CONTENTS

	Page
SUMMARY	i
DISCUSSION	2
I. The Commission Should Not Arbitrarily Expand Applicability of Rules Tailored to Multilateration Services to Also Apply to Non-Multilateration Systems.	2
II. Non-Multilateration LMS Operations Are Sufficiently Restricted to Localized Coverage Areas by the New Rules.	5
III. The Non-Multilateration Frequency Tolerance Proposed by Certain Petitioners Is Unnecessarily Restrictive.	7
IV. Field Strength Limits for Non-Multilateration LMS Systems Should Accurately Reflect Height and Power Limits Contained In the New Rules.	9
V. Any Modification of the Current Emission Mask Requirement Must Continue to Adequately Prevent Interference Between Multilateration and Non-Multilateration Systems.	11
VI. Non-Multilateration Transmissions Should Not Be Limited In Duration Or Interval.	13
CONCLUSION	15

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

RECEIVED

MAY 24 1995

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

In the Matter of)
)
)

Amendment of Part 90 of the)
Commission's Rules to Adopt)
Regulations for Automatic)
Vehicle Monitoring Systems)
)
_____)

PR Docket No. 93-61

OPPOSITION TO PETITION FOR RECONSIDERATION

Hughes Transportation Management Systems ("Hughes") hereby respectfully opposes certain proposals contained in Petitions for Reconsideration ("Petitions") of the new rules for the Location and Monitoring Service ("LMS"), adopted in the Report and Order in the above-captioned proceeding, released February 6, 1995 (the "Report and Order").^{1/}

Specifically, Hughes opposes the following requests for reconsideration:

(i) that certain of the new rules regarding interference between Part 15 devices and multilateration LMS systems be expanded to cover non-multilateration systems as well, as proposed by Metricom, Inc. ("Metricom"); (ii) that the Commission either reduce the transmit power limitation of non-multilateration LMS systems to one watt, or limit such systems to operating "within fifty meters of a highway toll plaza or rail siding," as proposed by the Part 15 Coalition; (iii) that the frequency tolerance for non-multilateration LMS systems be specified as proposed by AMTECH Corporation ("AMTECH") and Texas

^{1/} Notice of the Petitions for Reconsideration in this proceeding was published in the Federal Register on May 9, 1995. 60 Fed. Reg. 24,632.

Instruments Incorporated ("TI"); (iv) that the field strength value proposed by AMTECH be used to supplant strict non-multilateration height and power limits under certain conditions; (v) that the emission mask requirement be modified as proposed by certain multilateration service providers; and (vi) that non-multilateration signals be limited to a two-second duration, with only one signal permitted per monitored vehicle in any 30 minute period, as proposed by UTC. As discussed in greater detail below, the above proposals, as presented, are not supported by the record in this proceeding. If the Commission were to adopt these changes as currently recommended, the result would be to seriously limit development and deployment of innovative non-multilateration services.

DISCUSSION

I. The Commission Should Not Arbitrarily Expand Applicability of Rules Tailored to Multilateration Services to Also Apply to Non-Multilateration Systems.

In its Petition, Metricom asserts that certain sections of the new LMS rules should be modified so as to apply to non-multilateration systems. Metricom Petition at 17. These are: Section 90.353 (LMS Operations in the 902-928 MHz Band), Section 90.357 (Frequencies for LMS Systems in the 902-928 MHz Band), and Section 90.361 (Interference From Part 15 and Amateur Operations). In support of its assertion, Metricom argues only that wideband non-multilateration systems "will have the same problems sharing the 902-928 MHz band that their multilateration cousins do." Id.

Metricom is simply incorrect; its proposal ignores the technical and operational differences between non-multilateration and multilateration technologies, as already recognized by the Commission. Moreover, Metricom misreads the language of the rules in

question. Contrary to Metricom's claims, rule Sections 90.353 and 90.357 already appropriately address non-multilateration services.^{2/}

Section 90.361 of the new rules specifies technical conditions for Part 15 devices that, if satisfied, give rise to a presumption that such devices do not cause harmful interference to multilateration systems. Despite Metricom's belated claims to the contrary, non-multilateration facilities do not present a significant risk of interference with Part 15 devices, and were therefore purposely, and properly, omitted from the "safe harbor" provisions of this section.

As the Commission observed, "[b]ecause Part 15 devices operate at extremely low power and each has a limited area of operation, the record indicates that they can coexist more easily with non-multilateration LMS systems, which also operate with relatively short range." Report and Order at 18. This conclusion was echoed in a Petition for Reconsideration filed by the Part 15 Coalition, which stated that "Part 15 technologies should be able to coexist with . . . 'tag-reader' non-multilateration systems because tag-readers typically entail low power operation and because they generally operate in fixed positions." Coalition Petition at 17. In addition, non-multilateration systems using mobile tags are designed so that the tags only operate while within the limited coverage areas of fixed base

^{2/} For example, Section 90.353 provides that non-multilateration systems are subject to interference from ISM devices and government radiolocation stations, that they may operate on a non-exclusive basis in the 902-904 and 909-75-921.75 MHz bands, that they shall share the 919.75-921.75 MHz band with multilateration systems, that they may not provide non-vehicular location services, and that their maximum antenna height above ground is fifteen meters. Section 90.357 specifies the sub-bands authorized for non-multilateration systems, as well as those for multilateration systems. See Report and Order at 61-63.

stations. Consequently, there is no potential for interference between Part 15 devices and non-multilateration tags over city-wide areas, as could occur with respect to multilateration systems, which may transmit over entire metropolitan areas.

In this lengthy proceeding, some of the most difficult issues for the Commission to resolve have been those surrounding the likelihood of interference between Part 15 devices and multilateration LMS systems. Because of the distinct technical and operational characteristics of non-multilateration technologies described above, the possibility of interference between such systems and Part 15 devices is remote. Additionally, non-multilateration systems must be constructed at specified locations, such as highway interchanges, weigh stations, or toll plazas, and thus do not afford the flexibility of relocating to accommodate Part 15 device users, as is possible for multilateration systems. After careful consideration of these and other factors, the Commission correctly excluded non-multilateration systems from certain rules pertaining to Part 15 devices.

Practical experience tends to support the Commission's view. As Metricom notes, there is "an extraordinary number of Part 15 devices operating in the [902-928 MHz] band." Metricom Petition at 17. Likewise, many non-multilateration facilities have been constructed and placed into operation. Despite these existing co-channel operations, there is nothing in the record to indicate that significant interference problems exist between the two services, and Metricom offers no evidence in this regard.^{3/}

^{3/} In view of the contentious debate between Part 15 and multilateration proponents throughout this proceeding, it is hard to imagine that significant issues regarding interference between non-multilateration LMS operations and Part 15 devices would not have surfaced earlier.

Metricom has provided no reason to dispute the Commission's conclusions regarding likelihood of interference between non-multilateration LMS and Part 15 products, or to impose the Part 15 safe harbor, along with burdensome field test requirements, on non-multilateration system operators. Accordingly, the proposal of Metricom to apply those rules to non-multilateration services should be rejected by the Commission.

II. Non-Multilateration LMS Operations Are Sufficiently Restricted to Localized Coverage Areas by the New Rules.

The Part 15 Coalition incorrectly maintains that, under the new rules, a non-multilateration LMS operator could blanket an entire metropolitan area with a continuous, 30-watt signal, which would cause interference to "nearby" Part 15 devices. Coalition Petition at 18. The Coalition claims this possibility arises because the definition of "non-multilateration" in the new rules does not restrict such systems to tag-reader operations, and is thus overly broad. Id. See also Report and Order at 56 (definitions). To avoid such an outcome, the Coalition asks the Commission to either "reduce the applicable power limitation for non-multilateration LMS systems to one watt" or to "require that all such systems be operated within fifty meters of a highway toll plaza or rail siding." Id. However, such drastic changes are not needed; the new rules already effectively limit the size of non-multilateration coverage areas. Further, the proposed changes would severely limit the ability of non-multilateration licensees to provide many existing services and to develop and implement new services in the future.

The Coalition correctly points out that non-multilateration systems rely on communications between fixed stations and passing vehicles, typically through the use of

vehicle-mounted tags. Coalition Petition at 16-17. In order to preserve the "localized" nature of such services, the Commission adopted both a peak ERP limit of 30 watts and antenna height above ground limit of 15 meters. See Report and Order at 48.^{4/} The Commission adopted these provisions, in part, to enable "non-multilateration systems to share spectrum more easily with . . . users of Part 15 devices." Id. Thus, while the definition complained of by the Coalition does not specify that non-multilateration systems operate over relatively small coverage areas, the technical rules clearly do.

The Coalition's reference to the Commission's definition of non-multilateration to justify its proposed rule changes is a smoke screen for efforts to restrict non-multilateration LMS operations without any finding that the current rules are inadequate. The Coalition proposes new rules that would unnecessarily limit non-multilateration service offerings. Most existing non-multilateration services will not operate effectively if transmissions are limited to only one watt. Moreover, it is of no consequence that this is the power limit to which Part 15 equipment is subject. See Coalition Petition at 18. Such devices are capable of operating at extremely low power, and therefore enjoy the freedom to do so without individual licenses. Non-multilateration facilities, on the other hand, are licensed by the Commission, and are authorized to operate at the higher power levels required for effective operation.^{5/} As the Commission concluded in adopting the new rules,

^{4/} As corrected by Erratum released February 17, 1995, at ¶ 4.

^{5/} The Coalition claims that non-multilateration systems will be unlicensed, which is a misreading of the new rules. Id. But see Report and Order at 36-37 (describing licensing procedures for non-multilateration LMS facilities).

"persons operating unlicensed Part 15 devices have no vested or recognizable right to continued use of any given frequency." Report and Order at 20.

The Coalition's proposal to limit non-multilateration installations to toll plazas and rail sidings also has little relation to the claimed shortcomings in the Commission's definition. As pointed out above, the rules already provide for short range operation from any appropriate location. Furthermore, non-multilateration systems provide a variety of vehicle-related services beyond toll collection or rail car tracking, and will provide many more in the future. For example, such systems can be used to support automatic commercial truck administration and inventory management (including hazardous material tracking), road condition and services availability messaging, traffic control, route planning, parking facility monitoring, and customs and immigration checkpoint functions, among others.

The Coalition's proposals are an unsupported attempt to create new issues regarding the potential for interference, which has already been fully addressed in this proceeding. They are unnecessary, and would severely hinder the ability to provide non-multilateration services to the public. The Commission should therefore reject them.

III. The Non-Multilateration Frequency Tolerance Proposed by Certain Petitioners Is Unnecessarily Restrictive.

Hughes filed a Petition for Reconsideration of the new rules on April 24, 1995 ("Hughes Petition") asking the Commission to delete the frequency tolerance requirement for non-multilateration LMS systems, or to adopt a frequency tolerance that is consistent with bandwidths typically used in such systems. The new rules, at Section 90.213, limit non-

multilateration systems to a frequency tolerance of 0.00025%, or 2.5 ppm. Report and Order at 59.

As Hughes demonstrated, this standard is excessively restrictive, is not justified by the actual risk of out-of-band interference, and will significantly increase the cost of non-multilateration equipment. See Hughes Petition at 7-13. As a workable alternative to the newly adopted tolerance, Hughes proposed requiring that the emission mask now required to be observed at the edges of the designated LMS sub-bands be applied at the edges of bands for which individual systems are licensed. In the alternative, Hughes proposed a frequency tolerance of 0.066%, which would still be adequate to prevent interference with facilities on adjacent bands.

Two non-multilateration proponents, AMTECH Corporation ("AMTECH") and Texas Instruments Incorporated ("TI") have filed Petitions for Reconsideration in which they agree that the frequency tolerance for non-multilateration systems is overly restrictive. See AMTECH Petition at 13-14, TI Petition at 5-16. However, AMTECH and TI have each proposed alternative frequency tolerance specifications that continue to be unnecessarily restrictive. Hughes opposes these proposed specifications.

AMTECH suggests that non-multilateration systems operating at a prescribed distance from the edge of the non-multilateration sub-band be subject to a frequency tolerance of ± 40 kHz. AMTECH Petition at 14. TI recommends a non-multilateration frequency tolerance of 50 ppm. TI Petition at 6. While these suggested specifications are less restrictive than the frequency variation allowable under the new rules, Hughes believes that they still represent an unnecessary restriction on the design and operation of non-

multilateration systems, which will give rise to significant, unnecessary increases in the cost of non-multilateration transmission equipment.

As Hughes pointed out, and as TI agrees, antenna height and power limitations for non-multilateration LMS facilities sufficiently mitigate the risk of adjacent channel interference for such systems. See Hughes Petition at 11, TI Petition at 7. Moreover, the Commission has adopted a frequency plan for LMS systems that allocates spectrum for multilateration and non-multilateration systems in separate parts of the 902-928 MHz band, and which is subject to the emission mask requirement. Thus, the concerns for interference between multi- and non-multilateration systems, which originally prompted the frequency tolerance proposal for non-multilateration systems, no longer exists. Hughes urges the Commission to delete the current frequency tolerance requirements for non-multilateration systems, and, as suggested in Hughes' Petition, to either impose the emission mask requirement at the edges of authorized bands, or to increase the frequency tolerance to 0.066%, a level that is consistent with the bandwidth of typical non-multilateration systems.

IV. Field Strength Limits for Non-Multilateration LMS Systems Should Accurately Reflect Height and Power Limits Contained In the New Rules.

AMTECH has asked the Commission to modify its height and power limits for non-multilateration systems by permitting substitution of a field strength limit of 90 dB μ V/m at a distance of one mile from the transmit site. AMTECH claims that "[s]uch a requirement would result in a field strength equivalent to that which would be produced by a facility operating at 30 watts ERP from a height of 15 meters above ground." AMTECH Petition at 12 n. 21. Hughes' calculations indicate, however, that this proposed field strength limit

significantly exceeds that which would result from a 30 watt ERP at an antenna height of 15 meters, even in free space (without attenuation caused by intervening obstructions).

When realistic propagation models for suburban and urban conditions in which many systems will be transmitting are considered, the measured field strength at one mile will decrease significantly. Free space path loss is proportional to the inverse of the square of the distance from the signal source. A typical "suburban" environment, with some amount of obstruction due to structures and foliage, would produce signal path losses that are a function of the inverse of the distance from the point of origin to the power of 2.5. In urban environments, where path losses are more severe, such losses can be approximated using the inverse of the distance cubed.

The following table demonstrates the computed field strength at one mile for a 30 watt transmitter, at a height of 15 meters, for the three models suggested above.

Type of Path	Path Loss Model	Computed Field Strength
Free Space	$1/R^2$	80.4 dB μ V/m
Suburban	$1/R^{2.5}$	64.4 dB μ V/m
Urban	$1/R^3$	48.4 dB μ V/m

While Hughes does not disagree with AMTECH's suggestion that field strength measurements at a particular range from a non-multilateration transmitter can be an effective means of limiting system coverage areas, AMTECH's proposed standard of 90 dB μ V/m actually would result in ERP levels that are orders of magnitude higher than permitted under the new rules. Therefore, if the Commission adopts a field strength test, as AMTECH suggests, Hughes recommends that the limit be set well below that proposed by

AMTECH. For example, a field strength limit of 65 dB μ V/m, measured at one mile, offers a specification that is roughly consistent with the current rules, as applied in a suburban environment, and promotes the goal of minimizing interference between adjacent systems.

V. Any Modification of the Current Emission Mask Requirement Must Continue to Adequately Prevent Interference Between Multilateration and Non-Multilateration Systems.

A number of multilateration service providers have proposed a relaxation in the emission mask requirement contained in Section 90.209(m) of the new rules.^{6/} These Multilateration Parties propose that the current emission mask, represented by the formula:

$$A = 55 + 10 \log(P) \text{ dB}$$

(where A is out-of-band attenuation and P is the highest emission of the transmitter),

be modified to:

$$A = 16 + 0.4(P-50) + 10 \log(B) \text{ dB (minimum 31 dB, maximum 66 dB)}$$

(where A is the out-of-band attenuation, P is the percentage removed from the center frequency of the authorized band, and B is the authorized bandwidth).

Hughes agrees with the Multilateration Parties that the current rule requires greater attenuation than is actually required to prevent interference across the multilateration and non-multilateration sub-bands. Hughes further agrees that a gradual "roll-off" of out-of-sub-band emissions, as represented by the type of formulation proposed, would be

^{6/} See MobileVision L.P. ("MobileVision") Petition at 9-10, AirTouch Teletrac ("Teletrac") Petition at 6, Uniplex Corporation ("Uniplex") Petition at 6, Pinpoint Communications, Inc. ("Pinpoint") Petition at 19, Southwestern Bell Mobile Systems, Inc. ("SBMS") Petition at 22. (MobileVision, Teletrac, Uniplex, Pinpoint, and SBMS, collectively, the "Multilateration Parties").

acceptable, provided that the degree of attenuation remains sufficient to prevent significant interference in adjacent bands. However, signal attenuation based on the formula proposed by the Multilateration Parties would be insufficient to adequately avoid interference well into the band set aside for non-multilateration systems.

The risk of interference presented by the proposed attenuation formula is illustrated in Figure 1, attached hereto. The Figure presents a plot of attenuation versus distance from the center frequency of the authorized band, for a 30-watt signal, expressed as a percent of bandwidth. As shown in the plot, the line representing attenuation based on the proposed formula, with a slope of negative 0.4, does not approach 50 dB attenuation until the frequency in question is 150 percent removed from the center frequency of the authorized band. Thus, a transmission in the lower multilateration sub-band, 904-909.75 MHz (See Section 90.357) would only be attenuated by 30 dB at a distance of approximately 110% of bandwidth from the band center frequency, or at approximately 913.2 MHz.

The proposed formula would provide a mere 30 dB of attenuation of multilateration signals at a frequency distance of 3.45 MHz inside the non-multilateration sub-band. Because multilateration mobile transmitters will pass through coverage areas of non-multilateration systems, the degree of attenuation resulting from the formula proposed by the Multilateration Parties is insufficient to prevent harmful interference to non-multilateration systems operating well within their authorized band.

In order to increase the degree of attenuation over distance removed from the authorized band, Hughes proposes the following change to the formula offered by the Multilateration Parties:

$$A = 16 + 0.6(P-50) + 10 \log(B) \text{ dB (minimum 31 dB, maximum 66 dB).}$$

The resulting attenuation, plotted as a function of the percentage distance from the center of the signal's authorized band, shown in Figure 2, has a negative slope of 0.6. The greater attenuation would still permit multilateration operators to reduce out-of-band transmissions more gradually than under the current rule, while avoiding the significant risk of interference in the non-multilateration band caused by the formula proposed by the Multilateration Parties. For example, the revised formula would result in over 40 dB of attenuation at 913 MHz for a multilateration signal covering the entire 904-909.75 authorized band.

In view of the above relaxation of the out-of-band attenuation requirement, the Commission should further mitigate the risk of interference to non-multilateration systems by multilateration mobile transmitters, the Commission should also adopt a ten percent duty cycle limit for multilateration vehicle tags, with a maximum "on-time" of 100 msec. Because typical non-multilateration systems incorporate multiple interrogations of mobile tags passing through coverage zones, and because such zones typically permit greater than 100 msec of communication time, even at highway speeds, this proposed duty cycle will permit non-multilateration systems to successfully interrogate passing vehicle transponders, even when multilateration mobile transmitters are present.

VI. Non-Multilateration Transmissions Should Not Be Limited In Duration Or Interval.

UTC has suggested that the new rules be revised such that "[e]ach message to or from a vehicle or object being monitored may not exceed two seconds in duration, and each vehicle or object being monitored may not send or receive more than one message in any 30-minute period." UTC Petition at 10. As a non-multilateration service provider,

Hughes offers no position with respect to the applicability of the suggested rule to multilateration systems. However, such a restriction should not be applied in the case of non-multilateration LMS facilities. As discussed above and in the Hughes Petition, non-multilateration systems operate over relatively short ranges, and risk of interference with Part 15 devices is small. Therefore, restrictions on non-multilateration duty cycles are unnecessary.

Furthermore, vehicles monitored by non-multilateration systems generally spend a relatively short period of time within the coverage zone of such systems, although they may pass through successive coverage zones more than once in any 30 minute period. For example, commercial trucks may be interrogated by non-multilateration base stations at highway weigh stations, toll plazas, and other road-side locations used for verifying truck and driver credentials. Indeed, certain non-multilateration installations, such as those used in the I-75/AVION project supported by Hughes, include a number of base stations at each highway site, permitting multiple interrogations in a short timeframe. See Hughes Petition at 6 (discussing I-75/AVION systems). A literal reading of UTC's proposal could restrict such operations if base station facilities are spaced at less than 30-minute intervals.

The two-second limitation proposed by UTC is also inappropriate for non-multilateration LMS operations. It is likely that some non-multilateration services will entail communications between vehicles and road-side facilities greater than two seconds in duration. Further, the two-second restriction ignores the fact that non-multilateration fixed transmitters effectively operate continuously, in order to access mobile tags passing at high speed, while the mobile tags only transmit while within the coverage zone of a fixed

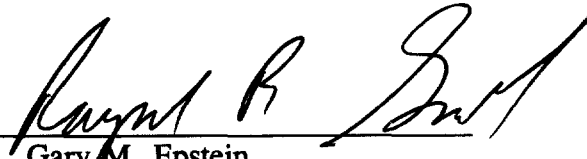
transmitter, and at much lower power. The duty cycle restrictions for mobile tags proposed by UTC would therefore have no effect on the likelihood of interference, and would render non-multilateration operations impossible, and should be rejected by the Commission as to such systems.

CONCLUSION

For the reasons stated above, the Commission should deny the relevant portions of the Petitions for Reconsideration filed by Metricom, the Part 15 Coalition, AMTECH, TI, MobileVision, Teletrac, Uniplex, Pinpoint, SBMS and UTC.

Respectfully submitted,

HUGHES TRANSPORTATION MANAGEMENT SYSTEMS

By: 
Gary M. Epstein
Raymond B. Grochowski
LATHAM & WATKINS
1001 Pennsylvania Ave., N.W.
Washington, D.C. 20004

May 24, 1995

FIGURE 1

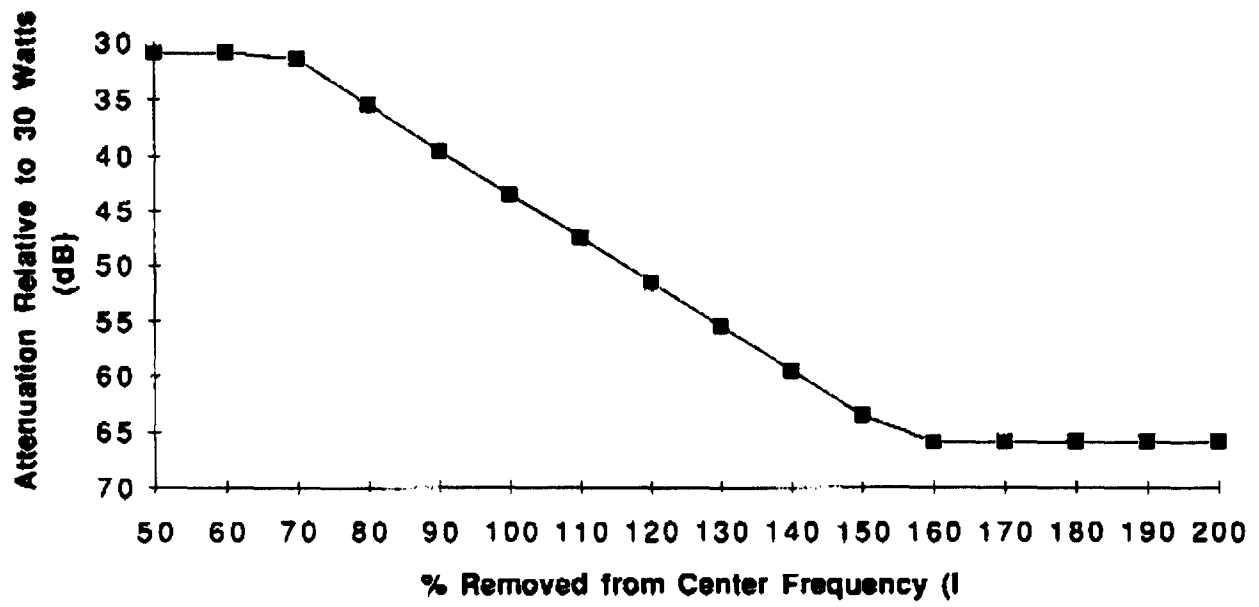
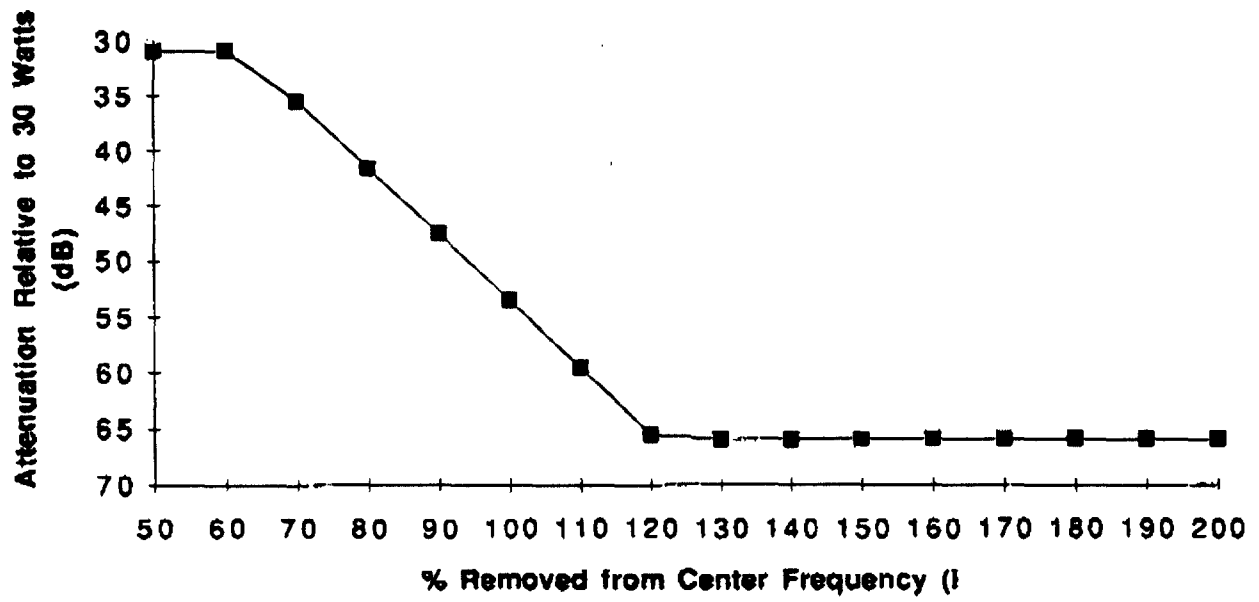


FIGURE 2



CERTIFICATE OF SERVICE

I hereby certify that a copy of the foregoing Opposition to Petition for Reconsideration of Hughes Transportation Management Systems was served by First Class Mail, postage prepaid, on May 24, 1995, upon:

Henry M. Rivera, Esq.
Larry S. Solomon, Esq.
Ginsburg, Feldman & Bress, Chtd.
1250 Connecticut Avenue, N.W.
Washington, D.C. 20036

Henry Goldberg, Esq.
Henrietta Wright, Esq.
W. Kenneth Ferre, Esq.
Goldberg, Godles, Weiner
& Wright
1229 Nineteenth Street, N.W.
Washington, D.C. 20036

David E. Hilliard, Esq.
Edward A. Yorkgitis, Jr., Esq.
Karen A. Kincaid, Esq.
Wiley, Rein & Fielding
1776 K Street, N.W.
Washington, D.C. 20006

Andrew D. Lipman, Esq.
Catherine Wang, Esq.
Swidler & Berlin, Chartered
3000 K Street, N.W.
Suite 300
Washington, D.C. 20007

John J. McDonnell, Esq.
Reed Smith Shaw & McClay
1200 18th Street, N.W.
Washington, D.C. 20036

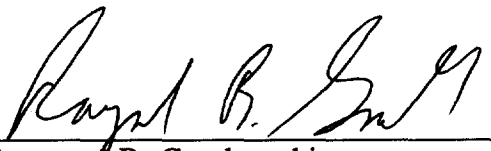
Theresa Fenelon, Esq.
Pillsbury Madison & Sutro
1050 Connecticut Avenue, N.W.
Suite 1200
Washington, D.C. 20036

David E. Hilliard, Esq.
Edward A. Yorkgitis, Jr., Esq.
Michael K. Baker, Esq.
Wiley, Rein & Fielding
1776 K Street, N.W.
Washington, D.C. 20006

McNeil Bryan
Uniplex Corporation
2905 Country Drive
St. Paul, MN 55117

Louis Gurman, Esq.
Jerome K. Blask, Esq.
Nadja S. Sodos, Esq.
Gorman, Kurtis, Blask
& Freedman, Chartered
1400 16th Street, N.W.
Suite 500
Washington, D.C. 20036

Jeffrey L. Sheldon, Esq.
UTC
1140 Connecticut Avenue, N.W
Suite 1140
Washington, D.C. 20036



Raymond B. Grochowski